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c. Otherwise, the basic model is determined to be in noncompliance.

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Subpart A—General Provisions

§ 431.1 Purpose and scope.

This part establishes the regulations for the implementation of Part C of Title III of the Energy Policy and Conservation Act, as amended, 42 U.S.C. 6311–6316, which establishes an energy conservation program for certain industrial equipment.

§ 431.2 Definitions.

For purposes of this part, words shall be defined as provided for in section 340 of the Act and as follows—

Accreditation means recognition by an accreditation body that a laboratory is competent to test the efficiency of electric motors according to the scope and procedures given in Test Method B

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of IEEE Standard 112-1996, *Test Procedure for Polyphase Induction Motors and Generators*, and Test Method (1) of CSA Standard C390-93, *Energy Efficient Test Methods for Three-Phase Induction Motors*.

Accreditation body means an organization or entity that conducts and administers an accreditation system and grants accreditation.

Accreditation system means a set of requirements to be fulfilled by a testing laboratory, as well as rules of procedure and management, that are used to accredit laboratories.

Accredited laboratory means a testing laboratory to which accreditation has been granted.

Act means the Energy Policy and Conservation Act of 1975, as amended (42 U.S.C. 6291 *et seq.*).

Alternative efficiency determination method or *AEDM* means a method of calculating the total power loss and average full load efficiency of an electric motor.

Average full load efficiency means the arithmetic mean of the full load efficiencies of a population of electric motors of duplicate design, where the full load efficiency of each motor in the population is the ratio (expressed as a percentage) of the motor's useful power output to its total power input when the motor is operated at its full rated load, rated voltage, and rated frequency.

Basic model means all units of a given type of covered equipment (or class thereof) manufactured by a single manufacturer, and, with respect to electric motors, which have the same rating, have electrical characteristics that are essentially identical, and do not have any differing physical or functional characteristics which affect energy consumption or efficiency. For the purpose of this definition, "rating" means one of the 113 combinations of an electric motor's horsepower (or standard kilowatt equivalent), number of poles, and open or enclosed construction, with respect to which § 431.42 prescribes nominal full load efficiency standards.

Certificate of conformity means a document that is issued by a certification program, and that gives written assurance that an electric motor complies with the energy efficiency standard ap-

plicable to that motor, as specified in 10 CFR 431.42.

Certification program means a certification system that determines conformity by electric motors with the energy efficiency standards prescribed by and pursuant to the Act.

Certification system means a system, that has its own rules of procedure and management, for giving written assurance that a product, process, or service conforms to a specific standard or other specified requirements, and that is operated by an entity independent of both the party seeking the written assurance and the party providing the product, process or service.

Covered equipment means industrial equipment of a type specified in section 340 of the Act.

CSA means CSA International.

Definite purpose motor means any motor designed in standard ratings with standard operating characteristics or standard mechanical construction for use under service conditions other than usual, such as those specified in NEMA Standards Publication MG1-1993, *Motors and Generators*, paragraph 14.03, "Unusual Service Conditions," or for use on a particular type of application, and which cannot be used in most general purpose applications.

DOE or *the Department* means the Department of Energy.

Electric motor is defined as follows:

(1) "Electric motor" means a machine which converts electrical power into rotational mechanical power and which:

(i) is a general purpose motor, including but not limited to motors with explosion-proof construction;

(ii) is a single speed, induction motor (MG1);

(iii) is rated for continuous duty (MG1) operation, or is rated duty type S1 (IEC);

(iv) contains a squirrel-cage (MG1) or cage (IEC) rotor, and has foot-mounting, including foot-mounting with flanges or detachable feet;

(v) is built in accordance with NEMA T-frame dimensions (MG1), or IEC metric equivalents (IEC);

(vi) has performance in accordance with NEMA Design A (MG1) or B (MG1)

characteristics, or equivalent designs such as IEC Design N (IEC); and

(vii) operates on polyphase alternating current 60-Hertz sinusoidal power, and:

(A) is rated 230 volts or 460 volts, or both, including any motor that is rated at multi-voltages that include 230 volts or 460 volts, or

(B) can be operated on 230 volts or 460 volts, or both.

(2) Terms in this definition followed by the parenthetical “MG1” must be construed with reference to provisions in NEMA Standards Publication MG1-1993, *Motors and Generators*, with Revisions 1, 2, 3 and 4, as follows:

(i) Section I, *General Standards Applying to All Machines*, Part 1, *Referenced Standards and Definitions*, paragraphs 1.16.1, 1.16.1.1, 1.17.1.1, 1.17.1.2, and 1.40.1 pertain to the terms “induction motor,” “squirrel-cage,” “NEMA Design A,” “NEMA Design B,” and “continuous duty” respectively;

(ii) Section I, *General Standards Applying to All Machines*, Part 4, *Dimensions, Tolerances, and Mounting*, paragraph 4.01 and Figures 4-1, 4-2, 4-3, and 4-4 pertain to “NEMA T-frame dimensions;”

(iii) Section II, *Small (Fractional) and Medium (Integral) Machines*, Part 11, *Dimensions—AC and DC Small and Medium Machines*, paragraphs 11.01.2, 11.31 (except the lines for frames 447T, 447TS, 449T and 449TS), 11.32, 11.34 (except the line for frames 447TC and 449TC, and the line for frames 447TSC and 449TSC), 11.35, and 11.36 (except the line for frames 447TD and 449TD, and the line for frames 447TSD and 449TSD), and Table 11-1, pertain to “NEMA T-frame dimensions;” and

(iv) Section II, *Small (Fractional) and Medium (Integral) Machines*, Part 12, *Tests and Performance—AC and DC Motors*, paragraphs 12.35.1, 12.35.5, 12.38.1, 12.39.1, and 12.40.1, and Table 12-2, pertain both to “NEMA Design A” and “NEMA Design B.”

(3) Terms in this definition followed by the parenthetical “IEC” must be construed with reference to provisions in IEC Standards as follows:

(i) IEC Standard 60034-1 (1996), *Rotating electrical machines*, Part 1: *Rating and performance*, with Amendment 1

(1997), Section 3: *Duty*, clause 3.2.1 and figure 1 pertain to “duty type S1”;

(ii) IEC Standard 60050-411 (1996), *International Electrotechnical Vocabulary Chapter 411: Rotating machines*, sections 411-33-07 and 411-37-26, pertain to “cage”;

(iii) IEC Standard 60072-1 (1991), *Dimensions and output series for rotating electrical machines—Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080*, clauses 2, 3, 4.1, 6.1, 7, and 10, and Tables 1, 2 and 4, pertain to “IEC metric equivalents” to “T-frame” dimensions; and

(iv) IEC Standard 60034-12 (1980), *Rotating electrical machines, Part 12: Starting performance of single-speed three-phase cage induction motors for voltages up to and including 660 V*, with Amendment 1 (1992) and Amendment 2 (1995), clauses 1, 2, 3.1, 4, 5, and 6, and Tables I, II, and III, pertain to “IEC Design N.”

Enclosed motor means an electric motor so constructed as to prevent the free exchange of air between the inside and outside of the case but not sufficiently enclosed to be termed airtight.

EPCA means the Energy Policy and Conservation Act of 1975, as amended (42 U.S.C. 6291 *et seq.*).

General purpose motor means any motor which is designed in standard ratings with either:

(1) Standard operating characteristics and standard mechanical construction for use under usual service conditions, such as those specified in NEMA Standards Publication MG1-1993, paragraph 14.02, “Usual Service Conditions,” and without restriction to a particular application or type of application; or

(2) Standard operating characteristics or standard mechanical construction for use under unusual service conditions, such as those specified in NEMA Standards Publication MG1-1993, paragraph 14.03, “Unusual Service Conditions,” or for a particular type of application, and which can be used in most general purpose applications.

IEC means the International Electrotechnical Commission.

IEEE means the Institute of Electrical and Electronics Engineers, Inc.

ISO means International Organization for Standardization.

Manufacture means to manufacture, produce, assemble, or import.

NEMA means the National Electrical Manufacturers Association.

Nominal full load efficiency of an electric motor means a representative value of efficiency selected from Column A of Table 12-8, NEMA Standards Publication MG1-1993, that is not greater than the average full load efficiency of a population of motors of the same design.

Open motor means an electric motor having ventilating openings which permit passage of external cooling air over and around the windings of the machine.

Secretary means the Secretary of the Department of Energy.

Special purpose motor means any motor, other than a general purpose motor or definite purpose motor, which has special operating characteristics or special mechanical construction, or both, designed for a particular application.

Total power loss means that portion of the energy used by an electric motor not converted to rotational mechanical power, expressed in percent.

APPENDIX A TO SUBPART A OF PART 431—POLICY STATEMENT FOR ELECTRIC MOTORS COVERED UNDER THE ENERGY POLICY AND CONSERVATION ACT

This is a reprint of a policy statement which was published on November 5, 1997 at 62 FR 59978.

POLICY STATEMENT FOR ELECTRIC MOTORS COVERED UNDER THE ENERGY POLICY AND CONSERVATION ACT

I. INTRODUCTION

The Energy Policy and Conservation Act (EPCA), 42 U.S.C. 6311, *et seq.*, establishes energy efficiency standards and test procedures for certain commercial and industrial electric motors manufactured (alone or as a component of another piece of equipment) after October 24, 1997, or, in the case of an electric motor which requires listing or certification by a nationally recognized safety testing laboratory, after October 24, 1999.¹

¹The term "manufacture" means "to manufacture, produce, assemble or import." EPCA section 321(10). Thus, the standards apply to motors produced, assembled, im-

EPCA also directs the Department of Energy (DOE or Department) to implement the statutory test procedures prescribed for motors, and to require efficiency labeling of motors and certification that covered motors comply with the standards.

Section 340(13)(A) of EPCA defines the term "electric motor" based essentially on the construction and rating system in the National Electrical Manufacturers Association (NEMA) Standards Publication MG1. Sections 340(13)(B) and (C) of EPCA define the terms "definite purpose motor" and "special purpose motor," respectively, for which the statute prescribes no efficiency standards.

In its proposed rule to implement the EPCA provisions that apply to motors (61 FR 60440, November 27, 1996), DOE has proposed to clarify the statutory definition of "electric motor," to mean a machine which converts electrical power into rotational mechanical power and which: (1) is a general purpose motor, including motors with explosion-proof construction;² (2) is a single speed, induction motor; (3) is rated for continuous duty operation, or is rated duty type S-1 (IEC)³; (4) contains a squirrel-cage or cage (IEC) rotor; (5) has foot-mounting, including foot-mounting with flanges or detachable feet; (6) is built in accordance with NEMA T-frame dimensions, or IEC metric equivalents (IEC); (7) has performance in accordance with NEMA Design A or B characteristics, or equivalent designs such as IEC Design N (IEC); and (8) operates on polyphase alternating current 60-Hertz sinusoidal power, and is (i) rated 230 volts or 460 volts, or both, including any motor that is rated at multi-voltages that include 230 volts or 460 volts, or (ii) can be operated on 230 volts or 460 volts, or both.

Notwithstanding the clarification provided in the proposed rule, there still appears to be

ported or manufactured after these statutory deadlines.

²Section 342(b)(1) of EPCA recognizes that EPCA's efficiency standards cover "motors which require listing or certification by a nationally recognized safety testing laboratory." This applies, for example, to explosion-proof motors which are otherwise general purpose motors.

³Terms followed by the parenthetical "IEC" are referred to in the International Electrotechnical Commission (IEC) Standard 34-1. Such terms are included in DOE's proposed definition of "electric motor" because DOE believes EPCA's efficiency requirements apply to metric system motors that conform to IEC Standard 34, and that are identical or equivalent to motors constructed in accordance with NEMA MG1 and covered by the statute.

uncertainty as to which motors EPCA covers. It is widely understood that the statute covers “general purpose” motors that are manufactured for a variety of applications, and that meet EPCA’s definition of “electric motor.” Many modifications, however, can be made to such generic motors. Motor manufacturers have expressed concern as to precisely which motors with such modifications are covered under the statute, and as to whether manufacturers will be able to comply with the statute by October 25, 1997 with respect to all of these covered motors. Consequently, motor manufacturers have requested that the Department provide additional guidance as to which types of motors are “electric motors,” “definite purpose motors,” and “special purpose motors” under EPCA. The policy statement that follows is based upon input from motor manufacturers and energy efficiency advocates, and provides such guidance.

II. GUIDELINES FOR DETERMINING WHETHER A MOTOR IS COVERED BY EPCA

A. General

EPCA specifies minimum nominal full-load energy efficiency standards for 1 to 200 horsepower electric motors, and, to measure compliance with those standards, prescribes use of the test procedures in NEMA Standard MG1 and Institute of Electrical and Electronics Engineers, Inc., (IEEE) Standard 112. In DOE’s view, as stated in Assistant Secretary Ervin’s letter of May 9, 1996, to NEMA’s Malcolm O’Hagan, until DOE’s regulations become effective, manufacturers can establish compliance with these EPCA requirements through use of competent and reliable procedures or methods that give reasonable assurance of such compliance. So long as these criteria are met, manufacturers may conduct required testing in their own laboratories or in independent laboratories, and may employ alternative correlation methods (in lieu of actual testing) for some motors. Manufacturers may also establish their compliance with EPCA standards and test procedures through use of third party certification or verification programs such as those recognized by Natural Resources Canada. Labeling and certification requirements will become effective only after DOE has promulgated a final rule prescribing such requirements.

Motors with features or characteristics that do not meet the statutory definition of “electric motor” are not covered, and therefore are not required to meet EPCA requirements. Examples include motors without feet and without provisions for feet, and variable speed motors operated on a variable frequency power supply. Similarly, multi-speed motors and variable speed motors, such as inverter duty motors, are not covered equipment, based on their intrinsic de-

sign for use at variable speeds. However, NEMA Design A or B motors that are single speed, meet all other criteria under the definitions in EPCA for covered equipment, and can be used with an inverter in variable speed applications as an additional feature, are covered equipment under EPCA. In other words, being suitable for use on an inverter by itself does not exempt a motor from EPCA requirements.

Section 340(13)(F) of EPCA, defines a “small electric motor” as “a NEMA general purpose alternating current single-speed induction motor, built in a two-digit frame number series in accordance with NEMA Standards Publication MG 1-1987.” Section 346 of EPCA requires DOE to prescribe testing requirements and efficiency standards only for those small electric motors for which the Secretary determines that standards are warranted. The Department has not yet made such a determination.

B. Electrical Features

As noted above, the Department’s proposed definition of “electric motor” provides in part that it is a motor that “operates on polyphase alternating current 60-Hertz sinusoidal power, and * * * can be operated on 230 volts or 460 volts, or both.” In DOE’s view, “can be operated” implicitly means that the motor can be operated successfully. According to NEMA Standards Publication MG1-1993, paragraph 12.44, “Variations from Rated Voltage and Rated Frequency,” alternating-current motors must operate successfully under running conditions at rated load with a variation in the voltage or the frequency up to the following: plus or minus 10 percent of rated voltage, with rated frequency for induction motors;⁴ plus or minus 5 percent of rated frequency, with rated voltage; and a combined variation in voltage and frequency of 10 percent (sum of absolute values) of the rated values, provided the frequency variation does not exceed plus or minus 5 percent of rated frequency. DOE believes that, for purposes of determining whether a motor meets EPCA’s definition of “electric motor,” these criteria should be used to determine when a motor that is not rated at 230 or 460 volts or 60 Hertz can be operated at such voltage and frequency.⁵

⁴For example, a motor that is rated at 220 volts should operate successfully on 230 volts, since $220 + .10(220) = 242$ volts. A 208 volt motor, however, would not be expected to operate successfully on 230 volts, since $208 + .10(208) = 228.8$ volts.

⁵The Department understands that a motor that can operate at such voltage and frequency, based on variations defined for successful operation, will not necessarily perform in accordance with the industry standards established for operation at the

NEMA Standards Publication MG1 categorizes electrical modifications to motors according to performance characteristics that include locked rotor torque, breakdown torque, pull-up torque, locked rotor current, and slip at rated load, and assigns design letters, such as Design A, B, C, D, or E, to identify various combinations of such electrical performance characteristics. Under section 340(13)(A) of EPCA, electric motors subject to EPCA efficiency requirements include only motors that fall within NEMA "Design A and B * * * as defined in [NEMA] Standards Publication MG1-1987." As to locked rotor torque, for example, MG1 specifies a minimum performance value for a Design A or B motor of a given speed and horsepower, and somewhat higher minimum values for Design C and D motors of the same speed and horsepower. The Department understands that, under MG1, the industry classifies a motor as Design A or B if it has a locked rotor torque at or above the minimum for A and B but below the minimum for Design C, so long as it otherwise meets the criteria for Design A or B. Therefore, in the Department's view, such a motor is covered by EPCA's requirements for electric motors. By contrast a motor that meets or exceeds the minimum locked rotor torque for Design C or D is not covered by EPCA. In sum, if a motor has electrical modifications that meet Design A or B performance requirements it is covered by EPCA, and if its characteristics meet Design C, D or E it is not covered.

C. Size

Motors designed for use on a particular type of application which are in a frame size that is one or more frame *series* larger than the frame size assigned to that rating by sections 1.2 and 1.3 of NEMA Standards Publication MG 13-1984 (R1990), "Frame Assignments for Alternating Current Integral-Horsepower Induction Motors," are not, in the Department's view, usable in most general purpose applications. This is due to the physical size increase associated with a frame series change. A frame series is defined as the first two digits of the frame size designation. For example, 324T and 326T are both in the same frame series, while 364T is in the next larger

motor's *rated* voltage and frequency. In addition, under the test procedures prescribed by EPCA, motors are to be tested at their rated values. Therefore, in DOE's view a motor that is not rated for 230 or 460 volts, or 60 Hertz, but that can be successfully operated at these levels, must meet the energy efficiency requirements at its rated voltage(s) and frequency. DOE also notes that when a motor is rated to include a wider voltage range that includes 230/460 volts, the motor should meet the energy efficiency requirements at 230 volts or 460 volts.

frame series. Hence, in the Department's view, a motor that is of a larger frame series than normally assigned to that standard rating of motor is not covered by EPCA. A physically larger motor within the same frame series would be covered, however, because it would be usable in most general purpose applications.

Motors built in a T-frame series or a T-frame size *smaller* than that assigned by MG 13-1984 (R1990) are also considered usable in most general purpose applications. This is because simple modifications can generally be made to fit a smaller motor in place of a motor with a larger frame size assigned in conformity with NEMA MG 13. Therefore, DOE believes that such smaller motors are covered by EPCA.

D. Motors with Seals

Some electric motors have seals to prevent ingress of water, dust, oil, and other foreign materials into the motor. DOE understands that, typically, a manufacturer will add seals to a motor that it manufactures, so that it will sell two motors that are identical except that one has seals and the other does not. In such a situation, if the motor without seals is "general purpose" and covered by EPCA's efficiency requirements, then the motor with seals will also be covered because it can still be used in most general purpose applications. DOE understands, however, that manufacturers previously believed motors with seals were not covered under EPCA, in part because IEEE Standard 112, "Test Procedure for Polyphase Induction Motors and Generators," prescribed by EPCA, does not address how to test a motor with seals installed.

The efficiency rating of such a motor, if determined with seals installed and when the motor is new, apparently would significantly understate the efficiency of the motor as operated. New seals are stiff, and provide friction that is absent after their initial break-in period. DOE understands that, after this initial period, the efficiency ratings determined for the same motor with and without seals would be virtually identical. To construe EPCA, therefore, as requiring such separate efficiency determinations would impose an unnecessary burden on manufacturers.

In light of the foregoing, the Department believes that EPCA generally permits the efficiency of a motor with seals to be determined without the seals installed. Furthermore, notwithstanding the prior belief that such motors are not covered by EPCA, use of this approach to determining efficiency will enable manufacturers to meet EPCA's standards with respect to covered motors with seals by the date the standards go into effect on October 25, 1997.

III. DISCUSSION OF HOW DOE WOULD APPLY EPCA DEFINITIONS, USING THE FOREGOING GUIDELINES

Using the foregoing guidelines, the attached matrix provides DOE's view as to which motors with common features are covered by EPCA. Because manufacturers produce many basic models that have many modifications of generic general purpose motors, the Department does not represent that the matrix is all-inclusive. Rather it is a set of examples demonstrating how DOE would apply EPCA definitions, as construed by the above guidelines, to various motor types. By extension of these examples, most motors currently in production, or to be designed in the future, could probably be classified. The matrix classifies motors into five categories, which are discussed in the following passages.

Category I—For “electric motors” (manufactured alone or as a component of another piece of equipment) in Category I, DOE will enforce EPCA efficiency standards and test procedures beginning on October 25, 1997

The Department understands that some motors essentially are relatively simple modifications of generic general purpose motors. Modifications could consist, for example, of minor changes such as the addition of temperature sensors or a heater, the addition of a shaft extension and a brake disk from a kit, or changes in exterior features such as the motor housing. Such motors can still be used for most general purpose applications, and the modifications have little or no effect on motor performance. Nor do the modifications affect energy efficiency.

Category II—For certain motors that are “definite purpose” according to present industry practice, but that can be used in most general purpose applications, DOE will generally enforce EPCA efficiency standards and test procedures beginning no later than October 25, 1999

General Statement

EPCA does not prescribe standards and test procedures for “definite purpose motors.” Section 340(13)(B) of EPCA defines the term “definite purpose motor” as “any motor designed in standard ratings with standard operating characteristics or standard mechanical construction for use under service conditions other than usual or for use on a particular type of application *and which cannot be used in most general purpose applications.*” [Emphasis added.] Except, significantly, for exclusion of the italicized language, the industry definition of “definite purpose motor,” set forth in NEMA MG1, is identical to the foregoing.

Category II consists of electric motors with horsepower ratings that fall between the horsepower ratings in section 342(b)(1) of EPCA, thermally protected motors, and motors with roller bearings. As with motors in Category I, these motors are essentially modifications of generic general purpose motors. Generally, however, the modifications contained in these motors are more extensive and complex than the modifications in Category I motors. These Category II motors have been considered “definite purpose” in common industry parlance, but are covered equipment under EPCA because they *can be used in most general purpose applications.*

According to statements provided during the January 15, 1997, Public Hearing, Tr. pgs. 238–239, Category II motors were, until recently, viewed by most manufacturers as definite purpose motors, consistent with the industry definition that did not contain the clause “which cannot be used in most general purpose applications.” Hence, DOE understands that many manufacturers assumed these motors were not subject to EPCA's efficiency standards. During the period prior and subsequent to the hearing, discussions among manufacturers resulted in a new understanding that such motors are general purpose under EPCA, since they *can* be used in most general purpose applications. Thus, the industry only recently recognized that such motors are covered under EPCA. Although the statutory definition adopted in 1992 contained the above-quoted definition of “definite purpose,” the delay in issuing regulations which embody this definition may have contributed to industry's delay in recognizing that these motors are covered.

The Department understands that redesign and testing these motors in order to meet the efficiency standards in the statute may require a substantial amount of time. Given the recent recognition that they are covered, it is not realistic to expect these motors will be able to comply by October 25, 1997. A substantial period beyond that will be required. Moreover, the Department believes different manufacturers will need to take different approaches to achieving compliance with respect to these motors, and that, for a particular type of motor, some manufacturers will be able to comply sooner than others. Thus, the Department intends to refrain from taking enforcement action for two years, until October 25, 1999, with respect to motors with horsepower ratings that fall between the horsepower ratings in section 342(b)(1) of EPCA, thermally protected motors, and motors with roller bearings. Manufacturers are encouraged, however, to manufacture these motors in compliance with EPCA at the earliest possible date.

The following sets forth in greater detail, for each of these types of motors, the basis for the Department's policy to refrain from enforcement for two years. Also set forth is

additional explanation of the Department's understanding as to why manufacturers previously believed intermediate horsepower motors were not covered by EPCA.

Intermediate Horsepower Ratings

Section 342(b)(1) of EPCA specifies efficiency standards for electric motors with 19 specific horsepower ratings, ranging from one through 200 horsepower. Each is a preferred or standardized horsepower rating as reflected in the table in NEMA Standards Publication MG1-1993, paragraph 10.32.4, *Polyphase Medium Induction Motors*. However, an "electric motor," as defined by EPCA, can be built at other horsepower ratings, such as 6 horsepower, 65 horsepower, or 175 horsepower. Such motors, rated at horsepower levels between any two adjacent horsepower ratings identified in section 342(b)(1) of EPCA will be referred to as "intermediate horsepower motors." In the Department's view, efficiency standards apply to every motor that has a rating from one through 200 horsepower (or kilowatt equivalents), and that otherwise meets the criteria for an "electric motor" under EPCA, including an electric motor with an intermediate horsepower (or kW) rating.

To date, these motors have typically been designed in conjunction with and supplied to a specific customer to fulfill certain performance and design requirements of a particular application, as for example to run a certain type of equipment. See the discussion in Section IV below on "original equipment" and "original equipment manufacturers." In large part for these reasons, manufacturers believed intermediate horsepower motors to be "definite purpose motors" that were not covered by EPCA. Despite their specific uses, however, these motors are electric motors under EPCA when they are capable of being used in most general purpose applications.

Features of a motor that are directly related to its horsepower rating include its physical size, and the ratings of its controller and protective devices. These aspects of a 175 horsepower motor, for example, which is an intermediate horsepower motor, must be appropriate to that horsepower, and would generally differ from the same aspects of 150 and 200 horsepower motors, the two standard horsepower ratings closest to 175. To re-design an existing intermediate horsepower electric motor so that it complies with EPCA could involve all of these elements of a motor's design. For example, the addition of material necessary to achieve EPCA's prescribed level of efficiency could cause the size of the motor to increase. The addition of magnetic material would invite higher inrush current that could cause an incorrectly sized motor controller to malfunction, or the circuit breaker with a standard

rating to trip unnecessarily, or both. The Department believes motor manufacturers will require a substantial amount of time to re-design and retest each intermediate horsepower electric motor they manufacture.

To the extent such intermediate horsepower electric motors become unavailable because motor manufacturers have recognized only recently that they are covered by EPCA, equipment in which they are incorporated would temporarily become unavailable also. Moreover, re-design of such a motor to comply with EPCA could cause changes in the motor that require re-design of the equipment in which the motor is used. For example, if an intermediate horsepower electric motor becomes larger, it might no longer fit in the equipment for which it was designed. In such instances, the equipment would have to be re-designed. Because these motors were previously thought not to be covered, equipment manufacturers may not have had sufficient lead time to make the necessary changes to the equipment without interrupting its production.

With respect to intermediate horsepower motors, the Department intends to refrain from enforcing EPCA for a period of 24 months only as to such motor designs that were being manufactured prior to the date this Policy Statement was issued. The Department is concerned that small adjustments could be made to the horsepower rating of an existing electric motor, in an effort to delay compliance with EPCA, if it delayed enforcement as to all intermediate horsepower motors produced during the 24 month period. For example, a 50 horsepower motor that has a service factor of 1.15 could be renameplated as a 57½ horsepower motor that has a 1.0 service factor. By making this delay in enforcement applicable only to pre-existing designs of intermediate horsepower motors, the Department believes it has made adequate provision for the manufacture of bona fide intermediate horsepower motor designs that cannot be changed to be in compliance with EPCA by October 25, 1997.

Thermally Protected Motors

The Department understands that in order to redesign a thermally protected motor to improve its efficiency so that it complies with EPCA, various changes in the windings must be made which will require the thermal protector to be re-selected. Such devices sense the inrush and running current of the motor, as well as the operating temperature. Any changes to a motor that affect these characteristics will prevent the protector from operating correctly. When a new protector is selected, the motor must be tested to verify proper operation of the device in the motor. The motor manufacturer would test the locked rotor and overload conditions, which could take several days, and the

results may dictate that a second selection is needed with additional testing. When the manufacturer has finished testing, typically the manufacturer will have a third party conduct additional testing. This testing may include cycling the motor in a locked-rotor condition to verify that the protector functions properly. This testing may take days or even weeks to perform for a particular model of motor.

Since it was only recently recognized by industry that these motors are covered by EPCA, in the Department's view the total testing program makes it impossible for manufacturers to comply with the EPCA efficiency levels in thermally protected motors by October 25, 1997, especially since each different motor winding must be tested and motor winding/thermal protector combinations number in the thousands.

Motors With Roller Bearings

Motors with roller bearings fit within the definition of electric motor under the statute. However, because the IEEE Standard 112 Test Method B does not provide measures to test motors with roller bearings installed, manufacturers mistakenly believed such motors were not covered. Under IEEE Standard 112, a motor with roller bearings could only be tested for efficiency with the roller bearings removed and standard ball bearings installed as temporary substitutes. Then on the basis of the energy efficiency information gained from that test, the manufacturer may need to redesign the motor in order to comply with the statute. In this situation, the Department understands that testing, redesigning, and retesting lines of motors with roller bearings, to establish compliance, would be difficult and time consuming.

Categories III, IV and V—Motors not within EPCA's definition of "electric motor," and not covered by EPCA

Close-coupled Pump Motors

NEMA Standards Publication MG1-1993, with revisions one through three, Part 18, "Definite-Purpose Machines," defines "a face-mounting close-coupled pump motor" as "a medium alternating-current squirrel-cage induction open or totally enclosed motor, with or without feet, having a shaft suitable for mounting an impeller and sealing device." Paragraphs MG1-18.601–18.614 specify its performance, face and shaft mounting dimensions, and frame assignments that replace the suffix letters T and TS with the suffix letters JM and JP.

The Department understands that such motors are designed in standard ratings with standard operating characteristics for use in certain close-coupled pumps and pumping applications, but cannot be used in non-pumping applications, such as, for example, conveyors. Consequently, the Department

believes close-coupled pump motors are definite-purpose motors not covered by EPCA. However, a motor that meets EPCA's definition of "electric motor," and which can be coupled to a pump, for example by means of a C-face or D-flange endshield, as depicted in NEMA Standards Publication MG1, Part 4, "Dimensions, Tolerances, and Mounting," is covered.

Totally-enclosed Non-ventilated (TENV) and Totally-enclosed Air-over (TEAO) Motors

A motor designated in NEMA MG1-1993, paragraph MG1-1.26.1, as "totally-enclosed non-ventilated (IP54, IC410)"⁶ is "not equipped for cooling by means external to the enclosing parts." This means that the motor, when properly applied, does not require the use of any additional means of cooling installed external to the motor enclosure. The TENV motor is cooled by natural conduction and natural convection of the motor heat into the surrounding environment. As stated in NEMA MG1-1993, Suggested Standard for Future Design, paragraph MG1-1.26.1a, a TENV motor "is only equipped for cooling by free convection." The general requirement for the installation of the TENV motor is that it not be placed in a restricted space that would inhibit this natural dissipation of the motor heat. Most general purpose applications use motors which include a means for forcing air flow through or around the motor and usually through the enclosed space and, therefore, can be used in spaces that are more restrictive than those required for TENV motors. Placing a TENV motor in such common restricted areas is likely to cause the motor to overheat. The TENV motor may also be larger than the motors used in most general purpose applications, and would take up more of the available space, thus reducing the size of the open area surrounding the motor. Installation of a TENV motor might require, therefore, an additional means of ventilation to continually exchange the ambient around the motor.

A motor designated in NEMA MG1-1993 as "totally-enclosed air-over (IP54, IC417)" is intended to be cooled by ventilation means

⁶IP refers to the IEC Standard 34-5: Classification of degrees of protection provided by enclosures for rotating machines. IC refers to the IEC Standard 34-6: Methods of cooling rotating machinery. The IP and IC codes are referenced in the NEMA designations for TENV and TEAO motors in MG1-1993 Part 1, "Classification According to Environmental Protection and Methods of Cooling," as a Suggested Standard for Future Design, since the TENV and TEAO motors conform to IEC Standards. Details of protection (IP) and methods of cooling (IC) are defined in MG1 Part 5 and Part 6, respectively.

external to (i.e., separate and independent from) the motor, such as a fan. The motor must be provided with the additional ventilation to prevent it from overheating.

Consequently, neither the TENV motor nor the TEAO motor would be suitable for most general purpose applications, and, DOE believes they are definite-purpose motors not covered by EPCA.

Integral Gearmotors

An "integral gearmotor" is an assembly of a motor and a specific gear drive or assembly of gears, such as a gear reducer, as a unified package. The motor portion of an integral gearmotor is not necessarily a complete motor, since the end bracket or mounting flange of the motor portion is also part of the gear assembly and cannot be operated when separated from the complete gear assembly. Typically, an integral gearmotor is not manufactured to standard T-frame dimensions specified in NEMA MG1. Moreover, neither the motor portion, nor the entire integral gearmotor, are capable of being used in most general purpose applications without significant modifications. An integral gearmotor is also designed for a specific purpose and can have unique performance characteristics, physical dimensions, and casing, flange and shafting configurations. Consequently, integral gearmotors are outside the scope of the EPCA definition of "electric motor" and are not covered under EPCA.

However, an "electric motor," as defined by EPCA, which is connected to a stand alone mechanical gear drive or an assembly of gears, such as a gear reducer connected by direct coupling, belts, bolts, a kit, or other means, is covered equipment under EPCA.

IV. ELECTRIC MOTORS THAT ARE COMPONENTS IN CERTAIN EQUIPMENT

The primary function of an electric motor is to convert electrical energy to mechanical energy which then directly drives machinery such as pumps, fans, or compressors. Thus, an electric motor is always connected to a driven machine or apparatus. Typically the motor is incorporated into a finished product such as an air conditioner, a refrigerator, a machine tool, food processing equipment, or other commercial or industrial machinery. These products are commonly known as "original equipment" or "end-use equipment," and are manufactured by firms known as "original equipment manufacturers" (OEMs).

Many types of motors used in original equipment are covered under EPCA. As noted above, EPCA prescribes efficiency standards to be met by all covered electric motors manufactured after October 24, 1997, except that covered motors which require listing or certification by a nationally recognized safety testing laboratory need not

meet the standards until after October 24, 1999. Thus, for motors that must comply after October 24, 1997, once inventories of motors manufactured before the deadline have been exhausted, only complying motors would be available for purchase and use by OEMs in manufacturing original equipment. Any non-complying motors previously included in such equipment would no longer be available.

The physical, and sometimes operational, characteristics of motors that meet EPCA efficiency standards normally differ from the characteristics of comparable existing motors that do not meet those standards. In part because of such differences, the Department is aware of two types of situations where strict application of the October 24, 1997 deadline could temporarily prevent the manufacture of, and remove from the marketplace, currently available original equipment.

One such situation is where an original equipment manufacturer uses an electric motor as a component in end-use equipment that requires listing or certification by a nationally recognized safety testing laboratory, even though the motor itself does not require listing or certification. In some of these instances, the file for listing or certification specifies the particular motor to be used. No substitution could be made for the motor without review and approval of the new motor and the entire system by the safety testing laboratory. Consequently, a specified motor that does not meet EPCA standards could not be replaced by a complying motor without such review and approval.

This re-listing or re-certification process is subject to substantial variation from one piece of original equipment to the next. For some equipment, it could be a simple paperwork transaction between the safety listing or certification organization and the OEM, taking approximately four to eight weeks to complete. But the process could raise more complex system issues involving redesign of the motor or piece of equipment, or both, and actual testing to assure that safety and performance criteria are met, and could take several months to complete. The completion time could also vary depending on the response time of the particular safety approval agency. Moreover, in the period immediately after October 24, the Department believes wholesale changes could occur in equipment lines when OEMs must begin using motors that comply with EPCA. These changes are likely to be concentrated in the period immediately after EPCA goes into effect on October 24, and if many OEMs seek to re-list or re-certify equipment at the same time, substantial delays in the review and approval process at the safety approval agencies could occur. For these reasons, the Department is concerned that certain end-user equipment that requires safety listing or certification

could become unavailable in the marketplace, because an electric motor specifically identified in a listing or certification is covered by EPCA and will become unavailable, and the steps have not been completed to obtain safety approval of the equipment when manufactured with a complying motor.

Second, a situation could exist where an electric motor covered by EPCA is constructed in a T-frame series or T-frame size that is smaller (but still standard) than that assigned by NEMA Standards Publication MG 13-1984 (R1990), sections 1.2 and 1.3, in order to fit into a restricted mounting space that is within certain end-use equipment. (Motors in IEC metric frame sizes and kilowatt ratings could also be involved in this type of situation.) In such cases, the manufacturer of the end-use equipment might need to redesign the equipment containing the mounting space to accommodate a larger motor that complies with EPCA. These circumstances as well could result in certain currently available equipment becoming temporarily unavailable in the market, since the smaller size motor would become unavailable before the original equipment had been re-designed to accommodate the larger, complying motor.

The Department understands that many motor manufacturers and OEMs became aware only recently that the electric motors addressed in the preceding paragraphs were covered by EPCA. This is largely for the same reasons, discussed above, that EPCA coverage of Category II motors was only recently recognized. In addition, the Department understands that some motor manufacturers and original equipment manufacturers confused motors that themselves require safety listing or certification, which need not comply until October 25, 1999, with motors that, while not subject to such requirements, are included in *original equipment* that requires safety listing or certification. Consequently, motor manufacturers and original equipment manufacturers took insufficient action to assure that appropriate complying motors would be available for the original equipment involved, and that the equipment could accommodate such motors. OEMs involved in such situations may often be unable to switch to motors that meet EPCA standards in the period immediately following October 24. To mitigate any hardship to purchasers of the original equipment, the Department intends to refrain from enforcing EPCA in certain limited circumstances, under the conditions described below.

Where a particular electric motor is specified in an approved safety listing or certification for a piece of original equipment, and the motor does not meet the applicable efficiency standard in EPCA, the Department's policy will be as follows: For the period of time necessary for the OEM to obtain a revised safety listing or certification for that

piece of equipment, with a motor specified that complies with EPCA, but in no event beyond October 24, 1999, the Department would refrain from taking enforcement action under EPCA with respect to manufacture of the motor for installation in such original equipment. This policy would apply only where the motor has been manufactured and specified in the approved safety listing or certification prior to October 25, 1997.

Where a particular electric motor is used in a piece of original equipment and manufactured in a smaller than assigned frame size or series, and the motor does not meet the applicable efficiency standard in EPCA, the Department's policy will be as follows: For the period of time necessary for the OEM to re-design the piece of equipment to accommodate a motor that complies with EPCA, but in no event beyond October 24, 1999, the Department would refrain from enforcing the standard with respect to manufacture of the motor for installation in such original equipment. This policy would apply only to a model of motor that has been manufactured and included in the original equipment prior to October 25, 1997.

To allow the Department to monitor application of the policy set forth in the prior two paragraphs, the Department needs to be informed as to the motors being manufactured under the policy. Therefore, each motor manufacturer and OEM should jointly notify the Department as to each motor they will be manufacturing and using, respectively, after October 24, 1997, in the belief that it is covered by the policy. The notification should set forth: (1) the name of the motor manufacturer, and a description of the motor by type, model number, and date of design or production; (2) the name of the original equipment manufacturer, and a description of the application where the motor is to be used; (3) the safety listing or safety certification organization and the existing listing or certification file or document number for which re-listing or re-certification will be requested, if applicable; (4) the reason and amount of time required for continued production of the motor, with a statement that a substitute electric motor that complies with EPCA could not be obtained by an earlier date; and (5) the name, address, and telephone number of the person to contact for further information. The joint request should be signed by a responsible official of each requesting company, and sent to: U.S. Department of Energy, Assistant Secretary for Energy Efficiency and Renewable Energy, Office of Building Research and Standards, EE-41, Forrestal Building, 1000 Independence Avenue, SW, Room 1J-018, Washington, DC 20585-0121. The Department does not intend to apply this policy to any motor for which it does not receive such a notification. Moreover, the Department may use the notification, and make further inquiries, to be sure

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motors listed in the notification meet the criteria for application of the policy.

This part of the Policy Statement will not apply to a motor in Category II, discussed above in section III. Because up to 24 months is contemplated for compliance by Category II motors, the Department believes any issues that might warrant a delay of enforcement for such motors can be addressed during that time period.

V. FURTHER INFORMATION

The Department intends to incorporate this Policy Statement into an appendix to its final rule to implement the EPCA provisions that apply to motors. Any comments or suggestions with respect to this Policy Statement, as well as requests for further information, should be addressed to the Director, Office of Building Research and Standards, EE-41, U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585-0121.

EXAMPLES OF MANY COMMON FEATURES OR MOTOR MODIFICATIONS TO ILLUSTRATE HOW THE EPCA DEFINITIONS AND DOE GUIDELINES WOULD BE APPLIED TO MOTOR CATEGORIES: GENERAL PURPOSE, DEFINITE PURPOSE, AND SPECIAL PURPOSE						
MOTOR MODIFICATION	CATEGORY ⁷					EXPLANATION
	I	II	III	IV	V	
A. ELECTRICAL MODIFICATIONS						
1 ALTITUDE	X					General purpose up to a frame series change larger.
2 AMBIENT	X					General purpose up to a frame series change larger.
3 MULTISPEED					X	EPCA applies to single speed only.
4 SPECIAL LEADS	X					
5 SPECIAL INSULATION	X					
6 ENCAPSULATION				X		Due to special construction.
7 HIGH SERVICE FACTOR	X					General purpose up to a frame series change larger.
8 SPACE HEATERS	X					
9 WYE DELTA START	X					
10 PART WINDING START	X					
11 TEMPERATURE RISE	X					General purpose up to a frame series change larger.
12 THERMALLY PROTECTED		X				Requires retesting and third party agency approval.
13 THERMOSTAT/THERMISTOR	X					
14 SPECIAL VOLTAGES					X	EPCA applies to motors operating on 230/460 voltages at 60 Hertz.
15 INTERMEDIATE HORSEPOWERS		X				Round horsepower according to 10 CFR 431.42 for efficiency.
16 FREQUENCY					X	EPCA applies to motors operating on 230/460 voltages at 60 Hertz.
17 FUNGUS/TROP INSULATION	X					

⁷Category I - General purpose electric motors as defined in EPCA.

Category II - Definite purpose electric motors that can be used in most general purpose applications as defined in EPCA.

Category III - Definite purpose motors as defined in EPCA.

Category IV - Special purpose motors as defined in EPCA.

Category V - Outside the scope of "electric motor" as defined in EPCA.

B. MECHANICAL MODIFICATIONS									
18	SPECIAL BALANCE	X							
19	BEARING TEMP. DETECTOR	X							
20	SPECIAL BASE/FEET						X		Does not meet definition of T-frame
21	SPECIAL CONDUIT BOX	X							
22	AUXILIARY CONDUIT BOX	X							
23	SPECIAL PAINT/COATING	X							
24	DRAINS	X							
25	DRIP COVER	X							
26	GROUND. LUG/HOLE	X							
27	SCREENS ON ODP ENCLOSURE	X							
28	MOUNTING F1, F2, W1-4; C1,2	X							Foot-mounting, rigid base, and resilient base.
C. BEARINGS									
29	BEARING CAPS	X							
30	ROLLER BEARINGS		X						Test with a standard bearing.
31	SHIELDED BEARINGS	X							
32	SEALED BEARINGS	X							Test with a standard bearing.
33	THRUST BEARINGS					X			Special mechanical construction.
34	CLAMPED BEARINGS	X							
35	SLEEVE BEARINGS					X			Special mechanical construction.
D. SPECIAL ENDSHIELDS									
36	C FACE	X							As defined in NEMA MG-1.
37	D FLANGE	X							As defined in NEMA MG-1.
38	CUSTOMER DEFINED					X			Special design for a particular application.
E. SEALS									
39	CONTACT SEALS	X							Includes lip seals and taconite seals - test with seals removed.
40	NON-CONTACT SEAL	X							Includes labyrinth and slinger seals - test with seals installed.

F. SHAFTS									
41	STANDARD SHAFTS/NEMA MG-1	X							Includes single and double, cylindrical, tapered, and short shafts.
42	NON STANDARD MATERIAL	X							
G. FANS									
43	SPECIAL MATERIAL	X							
44	QUIET DESIGN	X							
H. OTHER MOTORS									
45	WASHDOWN	X							Test with seals removed.
46	CLOSE-COUPLED PUMP				X				JM and JP frame assignments.
47	INTEGRAL GEAR MOTOR							X	Typically special mechanical design, and not a T-frame; motor and gearbox inseparable and operate as one system.
48	VERTICAL - NORMAL THRUST							X	EPCA covers foot-mounting.
49	SAW ARBOR					X			Special electrical/mechanical design.
50	TENV				X				Totally-enclosed non-ventilated not equipped for cooling (IP54, IC410).
51	TEAO				X				Totally-enclosed air-over requires airflow from external source (IP54, IC417).
52	FIRE PUMP	X							When safety certification is not required. See also EPCA §342(b)(1).
53	NON-CONTINUOUS							X	EPCA covers continuous ratings.
54	INTEGRAL BRAKE MOTOR					X			Integral brake design factory built within the motor.

9/10/97